

Amendments to the Claims

This listing of claims will replace all prior listings of claims in the application.

Listing of Claims

1. (Currently Amended) A method for monitoring operating conditions on one or more units of rotating equipment disposed within a facility which rotating equipment comprises a drive component having a rotating shaft and a driven component having a rotating part connected to said shaft, said rotating equipment including bearings therein which rotatably support said shaft and said rotating part thereon and including an exposed surface which has a surface temperature defined by the operating conditions of said bearings disposed proximate thereto, the method comprising the steps of:

providing a temperature data collector which is manually movable within said facility by an operator, said temperature data collector having a temperature sensor which is manually positionable within said facility by said operator to detect said surface temperature of said rotating equipment, said temperature data collector further including a data storage unit which receives and stores temperature data from said sensor;

defining one or more temperature sensing locations on said exposed surface of each said unit of said rotating equipment, each said bearing having one of said temperature sensing locations associated therewith which said sensing location is disposed proximate to said bearing such that a said surface temperature on said rotating equipment at said temperature sensing location indicates an operating temperature of said associated bearing;

performing a temperature data collection procedure on said rotating equipment, said temperature data collection

procedure comprising the steps of manually transporting said temperature data collector within said facility to an equipment location proximate said rotating equipment and manually positioning said temperature sensor adjacent to each said sensing location of said rotating equipment, detecting said surface temperatures on said rotating equipment by temperature readings of said sensing locations through said temperature sensor, and storing temperature data from each said temperature reading in said data storage unit of said data collector;

said data collection procedure further including the step of removing said temperature sensor from said equipment location by manually moving said temperature data collector to another location in said facility; and

repeating said data collection procedure periodically over time to detect and store said temperature data at periodic time intervals by manually transporting and returning said temperature data collector to said equipment location and repositioning said temperature sensor adjacent to said sensing locations; and

analyzing said temperature data by comparing each said temperature data from a last said temperature data collection procedure performed with reference temperature data to identify temperature increases in said rotating equipment indicating abnormal operating conditions of said bearings.

2. (Original) The method according to Claim 1, wherein said reference temperature data is defined by said temperature data of at least one prior said data collection procedure.

3. (Original) The method according to Claim 2, wherein a plurality of said prior data collection procedures are performed to generate said reference temperature data.

4. (Original) The method according to Claim 2, wherein said prior data collection procedure is defined by one said

data collection procedure performed immediately prior to said last data collection procedure.

5. (Currently Amended) A method for monitoring operating conditions on one or more units of rotating equipment disposed within a facility which rotating equipment comprises a drive component having a rotating shaft and a driven component having a rotating part connected to said shaft, said rotating equipment including bearings therein which rotatably support said shaft and said rotating part thereon, and said rotating equipment ~~further~~ including a process fluid and a ~~primary shaft~~ seal arrangement preventing leakage of said process fluid along said shaft, said seal arrangement including passages therein containing a seal passage fluid, said rotating equipment further including exposed surfaces respectively adjacent said bearings and said passages wherein each of said exposed surfaces has a surface temperature defined by the operating conditions of said respective bearing or passage fluid which said surface temperatures vary in response to the operating conditions of said bearings and said shaft seal arrangement, the method comprising the steps of:

providing a temperature data collector which is manually movable within said facility by an operator, said temperature data collector having a temperature sensor which is manually positionable within said facility by said operator to detect said surface temperatures of said rotating equipment, said temperature data collector further including a data storage unit which receives and stores temperature data from said sensor;

defining temperature sensing locations on said rotating equipment, said sensing locations being defined on said exposed surfaces adjacent said bearings and/or on and said seal passages, each said temperature sensing location associated with a said bearing indicating an operating temperature of said associated bearing, and each said sensing

location associated with a said ~~seal~~-passage indicating a temperature of said ~~seal~~-passage fluid therein;

performing a temperature data collection procedure on said rotating equipment, said temperature data collection procedure comprising the steps of manually transporting said temperature data collector within said facility to an equipment location proximate each said unit of said rotating equipment and manually positioning said temperature sensor adjacent to said sensing locations on said rotating equipment, detecting surface temperatures on said rotating equipment by temperature readings of said sensing locations through said temperature sensor, and storing temperature data from each said temperature reading in said data storage unit of said data collector;

repeating said data collection procedure periodically over time to detect and store said temperature data at periodic time intervals by manually transporting and returning said temperature data collector to said equipment location and repositioning said temperature sensor adjacent to said sensing locations;—and

said data collection procedure further including the step of removing said temperature sensor from said equipment location by manually moving said temperature data collector to another location in said facility; and

analyzing said temperature data by comparing each said temperature data from a last said temperature data collection procedure performed with reference temperature data to identify temperature increases in said rotating equipment indicating abnormal operating conditions of said bearings and/or said shaft seal arrangement.

6. (New) The method according to Claim 1, wherein said method further comprises the steps of providing a remote processing station separate from said rotating equipment, and transferring said temperature data from said data storage unit

of said temperature data collector where said processing station performs said analyzing step.

7. (New) The method according to Claim 6, wherein said data collection procedure includes the step of manually relocating said temperature data collector to said processing station for said transferring of said temperature data thereto, said transferring of said temperature data being performed prior to performance of the next said data collection procedure.

8. (New) The method according to Claim 1, wherein said processing station is a computer disposed within said facility.

9. (New) The method according to Claim 1, wherein said temperature data collector is a handheld unit comprising said temperature sensor and said data storage unit which are disposed within said handheld unit so as to be moved together by the operator.

10. (New) The method according to Claim 1, wherein a plurality of said units of said rotating equipment are provided which define a plurality of said equipment locations, said temperature data collector being moved from one said equipment location to a next said equipment location during said temperature data collection procedure.

11. (New) The method according to Claim 5, wherein said method further comprises the steps of providing a remote processing station separate from said rotating equipment, and transferring said temperature data from said data storage unit of said temperature data collector where said processing station performs said analyzing step.

12. (New) The method according to Claim 11, wherein said processing station is a computer disposed within said facility.

13. (New) The method according to Claim 5, wherein said temperature data collector is a handheld unit comprising said temperature sensor and said data storage unit which are disposed within said handheld unit so as to be moved together by the operator.

14. (New) The method according to Claim 5, wherein said passage fluid is supplied from said process fluid.

15. (New) A method for monitoring the operating conditions of a plurality of units of rotating equipment within a facility, said rotating equipment including relatively rotatable parts which comprise a rotating shaft, bearings which support the shaft and a shaft seal assembly which seals a sealed fluid within said rotating equipment to prevent said sealed fluid from leaking along said shaft, said rotating equipment having exterior surfaces which have surface temperatures which indicate the respective operating temperatures of the rotatable parts, the method comprising the steps of:

providing a portable temperature data collector which is manually movable within said facility by an operator, said temperature data collector including a temperature sensor which is manually positionable adjacent to said exterior surfaces to detect said surface temperatures of said exterior surfaces and which generates temperature data indicating said surface temperatures detected thereby, said sensor communicating with a data storage unit which receives and stores said temperature data for subsequent analysis;

defining temperature sensing locations on said rotating equipment respectively corresponding with each of said rotatable parts wherein said surface temperature on said

rotating equipment at each said sensing location indicates the operating temperature of said respective rotating part corresponding thereto;

performing a temperature data collection procedure on said rotating equipment at a collection time to determine the operating temperatures of said respective rotatable parts at said collection time, said temperature data collection procedure comprising the steps of manually transporting said temperature data collector within said facility to an equipment location proximate each said unit of said rotating equipment being monitored, manually positioning said temperature sensor adjacent to a plurality of said sensing locations, detecting said surface temperatures of said exposed surfaces at said plurality of said sensing locations with said temperature sensor and generating said temperature data corresponding to each of said sensing locations, storing said temperature data in said data storage unit, and manually removing said temperature data collector from each said equipment location after obtaining said temperature data for said sensing locations within said equipment location;

repeating said data collection procedure at subsequent collection times to detect and store said temperature data for each said collection time wherein said collection times are spaced from each other by selected time intervals and said temperature data collector is transported to each said equipment location and then removed therefrom at the end of each said data collection procedure;

storing said temperature data associated with each of a plurality of collection times to develop historical data for each said sensing location; and

analyzing said historical data by comparing the temperature data from a last said temperature data collection procedure with the temperature data from a prior said data collection procedures to identify abnormal changes in said operating temperatures of said rotatable parts; and

operating said rotating equipment in response to any said abnormal changes identified by said analysis.

16. (New) The method according to Claim 15, which includes the step of providing a processing unit which receives said temperature data and analyzes said historical data.

17. (New) The method according to Claim 16, which includes the step of transferring said temperature data to said processing unit after each said temperature data collection procedure.

18. (New) The method according to Claim 17, which includes the step of connecting said temperature data collector to said processing unit for said transferring of said temperature data.

19. (New) The method according to Claim 15, wherein one said sensor is used for detecting a plurality of said sensing locations.

20. (New) The method according to Claim 15, wherein said sensor is a portable sensor which is manually directed toward each said sensing location to detect said surface temperatures.

21. (New) The method according to Claim 15, wherein each temperature data collection procedure at each said collection time includes positioning said temperature sensor at a plurality of said equipment locations corresponding to a plurality of units of said rotating equipment such that said temperature data for each said collection time relates to said plurality of said units of said rotating equipment.



22. (New) The method according to Claim 21, wherein said temperature data for said plurality of said units of said rotating equipment is stored in said data storage unit until the end of said temperature data collection procedure.